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催化、动力学与反应器

往复式惰性多孔介质燃烧器的可燃极限及最大半周期

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摘要

借助于先前推导的简化理论解，利用分段线性函数，构建了燃烧器内温度分布曲线、可燃极限和最大半周期。该解适用于绝热条件下往复式惰性多孔介质燃烧器。结果表明，当流速小于0.12 m·s-1时，理论解预测的可燃极限与实验取得了相同的趋势，增大流速可以获得较小的可燃极限。而流速大于0.17 m·s-1时，增大流速对扩展可燃极限的影响很小。同时，小孔径的多孔介质更有利于扩展可燃极限。预测的最大半周期与流速的乘积与固体和气体热容的比值呈线性关系;燃烧器的长度对最大半周期有显著的影响。增大燃烧器的长度将导致较大的最大半周期。预测的可燃极限和推导出的最大半周期为燃烧器的设计和进一步改善提供了指导。

关键词

可燃极限 最大半周期 多孔介质燃烧器 往复

分类号

Flammable limits and maximum half cycle for inert porous medium burner with reciprocating flow

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Abstract

Based on the simplified theoretical solution deduced by the authors，the temperature profiles in the burner，the flammable limit and maximum half cycle were theoretically predicted by a piecewise linear function.These solution were applicable to inert porous medium combustors with reciprocating flow without heat loss to the surrounding.The predicted flammable limits showed the same trends as experiments for gas velocities less than 0.12 m·s-1，indicating that the lean flammable limit was getting lower with increasing gas velocity.However，when the gas velocity was greater than 0.17 m·s-1，it had little effect on the flammable limits.Computational results also showed that the flammable limits could be extended with porous media of smaller pore sizes.In addition，it was shown that the predicted maximum half cycle was proportional to the product of gas velocity and the specific heat ratio of solid to gas.The combustor length had significant influence on the maximum half cycle and a longer length permitted a larger half cycle. The predicted flammable limits and maximum half cycle provided a guidance for the combustor design and some insights into the further improvement of combustor performance.

Key words

flammable limit maximum half cycle porous medium burner reciprocating flow

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